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## ORIGINAL ARTICLES.

### AN ACCURATE METHOD TO RECORD THE SIZE OF LESIONS IN THE OCULAR FUNDUS.

(Preliminary Notes.)

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Among the more striking advantages of the large Gullstrand ophthalmoscope (Zeiss) are the excellent illumination of the ocular fundus, the size of the field under immediate observation, and the range of magnification from 8 to 40 diameters by simple change of oculars. By the careful fixation of the head and the addition of an adjustable fixation point for the eye, we may study the ocular fundus with the same ease and accuracy with which we look over a section under a compound microscope.

By the use of special oculars further advantages are secured. The adjustable binocular eyepiece gives an excellent stereoscopic view of the fundus while the demonstration ocular makes it possible for two observers to study the fundus at the same time. With the latter a lesion in the fundus can be demonstrated to the family physician or medical student, or even to members of the patient's family; parent, husband, etc. In our experience this has enabled us to secure intelligent co-operation in the treatment of cases (i.e., in retinal hæmorrhage, etc.) with greater facility than where the entire statement concerning the examination of the fundus had to be taken on simple faith by those vitally interested.

Further, the excellent illuminating system enables us to get a good view of the fundus in cases where advanced lens changes,

and other opacities in the media made it impossible to do so with the ordinary ophthalmoscope. This advantage which we first observed in a case of zonular cataract and demonstrated to the Ophthalmological Section of the St. Louis Medical Society (October, 1914) has been repeatedly confirmed by the examination of other cases.

The accurate determination of the size of a given fundus lesion was not originally provided for in the instrument. Such measurement is made possible by our suggestion to insert a micrometer scale in the ocular. Bausch and Lomb now supply the same through the courtesy of Mr. Max Poser, representative of "Zeiss" in this country. The scale consists of 8 mm. divided into 0.1 mm. spaces. It can be attached permanently in one of the oculars, or better still to a tube fitted to slide into the ocular so that it can be removed at will.

We first had it attached to the demonstration ocular. This made possible the simultaneous measurement of the optic disc, etc., by two observers. The uniformity of the measurements proved the method to be entirely practical. The size of the disc varied from 27 to 30 spaces in different individuals. High myopia or hypermetropia or astigmatism did not change these measurements more than 5 spaces. Accommodation did not cause a variation greater than 2 or 3 spaces in a given case. Roughly, the value of each space was found to be 0.15+mm. (1/7 mm.) in actual fundus measure. To determine the value of a space with absolute and minute accuracy would require elaborate calculations for each case, with careful measurements of the curvatures of the corneal and lenticular surfaces and their relative positions with accommodation completely suspended.

However, the greatest value of this new method is not the possibility of determining the size of fundus lesions in fractions of millimeters or inches, but in recording that size by a fixed scale under conditions which can be duplicated. Thus, any appreciable change in the size of a spot in the fundus in a given case can be detected by a measurement made under the same conditions, months or years after the first measurement. An extensive report on fundus measurements showing variation in the size of lesions is necessarily omitted in these preliminary notes. We have become convinced of its value in connection with the local reaction in the fundus in tubercular choroiditis on the injection of tuberculin. That is only one of many instances where a record on a fixed scale will eliminate the fallacy of

more or less vague impression concerning the relative size of fundus lesions at repeated examinations.

It is not necessary to emphasize the value of such a record to every practical ophthalmologist. It is true the use is restricted to some such instrument as the Gullstrand ophthalmoscope. However, as soon as a larger supply of these instruments (now shut off by the European War) can be obtained, they probably will be available, if not actually in their possession, for every ophthalmologist in the larger cities.

For general use the large ophthalmoscope on a fixed base will never supplant the hand ophthalmoscope; yet its special advantages made it a most desirable adjunct for the oculist's armamentarium.

It is of interest to note in this connection that Leroy (Un Ophtalmoscopométre à micrométre,—*Revue Génér. d'Ophtalmol.*, T. X., p. 438, 1891), a quarter of a century ago, attempted to project a micrometer scale across one-half the opening of an ophthalmoscope by means of a reflecting prism to furnish a scale for the measurement of fundus lesions. It required rather difficult adjustment and never came into general use. The use of the method above suggested is much more simple and reliable.

# A LARGE PIGMENT BALL BETWEEN THE DETACHED RETINA AND CHOROID.

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It frequently happens that the routine microscopical examination of enucleated eyes yields valuable and interesting findings and often surprises. The case herein reported was of such a nature. The eyeball was that of a young female child with the following clinical history. At the age of 5½, with one arm in a sling the result of a fracture, the child stumbled and fell while holding open scissors in the free hand. The point of the scissors penetrated the cornea of the left eye. The child was put to bed without medical attention and remained there for two or three weeks. There was no bleeding at the time of the accident. When she became a patient at the St. Louis Children's Hospital one year later for orthopædic treatment, the eyeball was sightless and shrunken. It was considered best for the child's interests to enucleate the globe, which was done December 17, 1914, by Dr. John Green, Jr. The specimen was treated in the usual manner—bisected and the halves embedded in celloidin.

When this physical eyeball reached the laboratory of ophthalmological pathology of Washington University, it showed microscopically as the main feature an indrawn scar in the cornea, passing through its centre and almost reaching its periphery. When divided it was found that to the scar were adherent internally the iris and a thick cyclitic membrane, which probably contained some remnants of the crystalline lens. Posteriorly the totally detached retina merged, also, into this conglomerated tissue. The space between retina and choroid was filled with a coagulated amorphorus exudate. As is in phthisical eyeball always the case, the sclerotic, especially at the posterior pole, was considerably thickened. Behind the detached retina and a little posteriorly to the pars nonplicata of the ciliary body there was a round pigmented body which in the hardened specimen had a diameter of 1 mm.

On microscopic examination the cornea showed the well-known picture of a dense scar tissue, containing some blood-

vessels and reaching through the whole thickness of the cornea. The surface epithelium reached deeply into this tissue. On the posterior surface the scar tissue passed through the perforated and folded Descemet's membrane into the anterior chamber. To this projection of the newformed tissue and to the neighboring folded Descemet's membrane, the pupillary edge of the iris was attached firmly on both sides (in the section). This attached portion of the iris was very much swollen, while the remainder of the iris separated from the posterior surface of the cornea by what was left of the anterior chamber was very much thinner than in the norm. The whole iris tissue was filled with round cells, and those of the bloodvessels which were still in existence were hyperæmic. What was left of the anterior chamber was filled with a coagulated exudate containing numerous lymphocytes. Besides the central total anterior synechia of the iris there was, also, a total peripheral synechia. The whole anterior surface of free iris is covered with a dense newformed tissue consisting apparently of long spindle cells arranged in lamellæ, which make it appear very much like corneal tissue. This newformed tissue contains no bloodvessels, but shows in parts as fairly dense round cell infiltration. This tissue may have taken its origin from the endothelium of Descemet's membrane, or, perhaps, be the result of an organization of a former hypopyon. The former is probably the correct interpretation.

Right behind the anterior synechia of the iris lies the lens capsule, empty of lens tissue and folded and wrinkled in the well-known manner. The few larger and some smaller cavities left between the folds are filled with round cells. There are, also, remnants of a comparatively recent hæmorrhage in this neighborhood.

Back of this a dense cyclitic membrane stretches across the interior of the eye. This membrane to which the folds of the detached retina are attached, has by its shrinkage pulled the ciliary body forward and inward; pigmented cell cylinders reach for quite a distance into it from the stretched ciliary processes. In one place, where the lens capsule is attached to the cyclitic membrane, there is some osteoid tissue and a small scale of bone tissue. The whole of the cyclitic membrane is densely infiltrated, as is also the ciliary body and the choroid immediately posterior to it.

Thus far we have simply to deal with an eyeball which has suffered from a severe infected wound, with the general re-

sults of such a trauma and which is now showing all the signs of a recent inflammation in all its tissues.

The chief interest, however, attaches to the peculiar spherical pigment body lying behind the detached retina, which could be seen even macroscopically. (Fig. 1.)

On microscopical examination it is seen to consist of a mass of pigmented cells, so dark that no cell outlines can be made out. This pigment ball, if we may call it so, is surrounded by an envelope of fibrous connective tissue of slightly varying thickness

Fig. 1.

and containing some pigment, especially in its most peripheral layers. At one place only, towards the interior of the eye, there is a break in the continuity of the connective tissue envelope. Here the pigment cells pierce the envelope and spread over the edges to some extent. (See Fig. 2.) This gives the appearance as if the pigment ball had broken off from the tissue from which it sprang. There is hardly any doubt that this was the pigmented epithelial cell layer. In bleached specimens the cells of which the ball is composed, although more or less spherical, have assumed all sorts of shapes which in no way remind one of the

pigmented epithelial cells, as we see it when such cells are separated from the original pigmented epithelium cell layer.

Small roundish bodies lying on this layer or somewhat removed from it are not so infrequently found in eyes with a detached retina. At times they contain a so-called colloid body,

Fig. 2.

sometimes with a deposit of lime. Yet, these are usually microscopic in size and show no such connective tissue envelope. In our case there must have been other influences at work to produce so large a pigment cell ball and to furnish it with such an envelope.

# MELANO-SARCOMA OF CILIARY BODY FOLLOWED BY FATAL METASTATIC TUMOR IN ABDOMEN.

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No remedy has been found to be as reliable as the early and complete surgical eradication of malignant growths. When such a course involves the enucleation of an eye still possessing the power of useful vision, both the patient and physician way well hesitate until absolutely convinced of the correctness of diagnosis. However, the life and welfare of the patient can only be conserved if the advice of the physician is promptly executed.

Added to the interest which belongs to the clinical and histological report of any case of sarcoma of the ciliary body, this one is a warning to secure "safety first" by early surgical intervention, which this patient spurned until too late.

Mrs. X., white, widow, aged 65, was first seen November 14, 1910, on account of ocular discomfort ascribed to ill-fitting spectacles. She was apparently rendered comfortable with O.D.—0.5 Sph. —1. cyl. ax. —150°; O.S.+0.5 Sph.+0.5 cyl. ax+75°, for distance, and +2.5 Sph. added right and left for reading.

With this correction her vision O.D.=16/19; O.S.=16/12.

Ophthalmoscopic examination revealed nothing pathological in either eye.

Three weeks later she returned having inadvertently exchanged her glasses with someone. An examination of O.D. at this time showed a single subconjunctival pigment streak at the upper nasal limbus. Measurement with the ocular micrometer of the Czapski corneal microscope showed it to be 0.8 mm. long and 0.32 mm. wide. More striking was a dark discoloration at the base of the iris in this quadrant through irregular masses of pigment. Also, the pupil did not dilate fully in this quadrant. The ophthalmoscope revealed nothing pathological in the fundus, but both ophthalmoscope and corneal microscope showed a mass behind the iris (between iris and lens) in the upper nasal quadrant and fine diffuse deposits on Descemet's membrane O.D. The field of vision showed a retraction of 20° to 30° on the temporal side. The intraocular tension by finger was a trifle high. Outwardly, the eye showed no hyperæmia or other inflammatory symptoms.

Although a Wassermann test proved to be negative, the patient

was temporarily placed on specific treatment and her relatives were warned in regard to the probable malignant character of the new development in the right eye. Contrary to advice, patient insisted upon going south at once for the remainder of the winter, according to her custom. She was given a note to Dr. J. H. Bell, of San Antonio, Texas, near which city she would reside that season, but the note was *not* delivered.

Five months later, May 10, 1911, O.D. V. was reduced to 16/48 with correction (—3. Sph.) Ophthalmoscope now showed some opacities in media, chiefly in lens O.D., which fully accounted for the loss of vision. Even without mydriatic the pupil was slightly distorted, but there was no other evidence of increase in size of the growth behind the iris. The pigment streak at the upper nasal limbus remained the same size. There were beginning opacities in the periphery of the lens O.S. also. Patient claimed to feel better under specific treatment which had been kept up during her absence. In spite of warning she refused absolutely to remain in St. Louis under observation.

She did not return until *one year* later, May 4th, 1912. She now had pain in O.D. Though V. O.D. remained unchanged, 16/48 with correction, the Schiötz tonometer showed O.D. T= 43 mm.; O.S. T.=15 mm.

The mass behind the iris was now so prominent that the border of the pupil in the upper nasal quadrant was a straight line. The anterior surface of the iris showed the outline of the pigmented mass behind, by its bulging and dark color. Two streaks of pigment were now present under the conjunctiva at the limbus in the upper nasal quadrant. Though of larger size, these streaks did not present any bulging nodule on the surface of the sclera.

Not the least doubt remained as to the character of this slowly growing tumor. Notice that 18 months after the first signs of it were detected it did not extend beyond the upper nasal quadrant and adjoining limbus. The clinical diagnosis was unmistakably that of melano-sarcoma of the ciliary body.

The patient was informed that the only therapeutic measure to be considered was the immediate enucleation of the eye. She spurned the advice, said she would take her chances, and left the office in a fit of temper.

Four months later, September 17, 1912, she returned on account of intense suffering from pain in O.D. Tension was increased to 65 mm. O.D. and vision reduced to 16/150. The ophthalmoscope showed a fair fundus reflex through the par-

tially opaque lens, but no details of fundus. The tumor mass behind the iris seemed to push the lens back as well as the iris forward. After a final consultation with Dr. W. A. Shoemaker, who fully confirmed the advice the patience had received, the eye was enucleated three days later, almost two years after the growth was first detected. Recovery was uneventful.

She was last seen May 2, 1913 (7½ months after the enucleation), for the fitting of a new artificial eye. Examination revealed nothing pathological in right socket. O.S. with glasses V. 16/15.

About one year after the enucleation she consulted Dr. H. W.

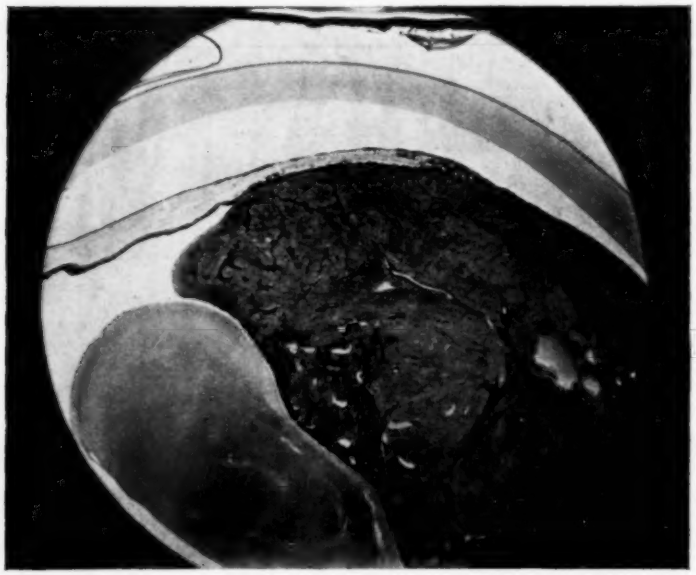

Fig. 1.—Showing position of growth between lens and iris.

Soper, who has kindly furnished the following report on her case:

"She complained of general soreness about the back and sides, with general weakness and loss of weight. These symptoms had persisted for two months. A small hard mass was found just above the umbilicus, very deeply seated and apparently attached to the vertebral column. There was no evidence of any primary lesion in the gastro-intestinal tract. This mass grew quite rapidly and other large masses formed in the peritoneal cavity evidently metastatic in origin. There was no operation nor autopsy and we never determined the exact nature of the growth."

She died December 8, 1913, fourteen and one-half months after the enucleation and 3 years after the primary growth appeared in the eye.

Histological examination proved the ocular tumor to be a melano-sarcoma, apparently originating in the anterior segment of the ciliary body, probably from the ciliary processes.

Pigmented spindle cells predominated. In its growth the tumor mass was projected inward and forward in the direction of the ciliary processes between the lens and iris. There was relatively little invasive tendency. The normal histological elements of the posterior segment of the ciliary body were practically intact

Fig. 2.—Secondary tumor at anterior angle of anterior chamber.

even in the upper nasal quadrant, where the tumor was located.

The iris was pushed forward, but lay upon the growth. It was not invaded by tumor cells except at its base.

The pressure of the tumor on the lens resulted in breaking down and absorption of the subcapsular fibers in the sector directly involved. Otherwise, the position of the lens was not disturbed.

The vessels of the choroid, retina, and optic nerve were congested and the walls of the arteries thickened in places. The retinal zone anterior to the equator showed cystoid degeneration

not inconsistent with the age of the patient. Otherwise, there was nothing pathological in these tissues.

An interesting development was the formation of a rounded tumor mass—not more than 1¼ mm. in its greatest diameter in the inferior angle of the anterior chamber. Loose tumor cells gravitating in the aqueous humor and becoming entangled in the spaces of Fontana explain the origin of this growth. More loose cells were found lying free upon its upper surface and on Descemet's membrane.

It was probably the development of this secondary growth blocking the inferior irido-corneal angle together with the increase in size of the mass in the upper nasal quadrant that brought on the glaucomatous pain which finally induced the patient to have the eye removed.

The few pigmented tumor cells which had wandered through the sclera where it is perforated by blood vessels at the limbus and had given the early warning of mischief in the making, by a subconjunctival pigmented streak, showed little activity. Only a few fresh cells had been added by new growth. Though the streak of pigment had increased it did not become a subconjunctival ridge, but remained a mere stain.

The history of this tumor is that of very slow growth in the earlier stage. This applies also to the metastatic growth in the abdomen. The latter caused scarcely any symptoms and could not be diagnosticated until a year after the enucleation of the eye. We may assume, however, that it originated weeks or months before the primary growth in the eye was removed.

It always is interesting to speculate as to the causes which inhibit or direct the growth of a malignant tumor. Certainly, in this case, growth in the eye was not restrained by the intraocular tension. It was growing most rapidly when the tension was getting progressively higher. Also, the slight invasion of the tissue in which the tumor originates is of interest in considering their general development. Sarcomata of the uveal tract not infrequently grow to considerable size within the globe while springing from a small base. Exceptionally, we have a type which infiltrates the uveal tissues chiefly, showing little increase in bulk.

Whenever we understand these peculiarities of tissue resistance to malignancy, the entire problem of malignant growths will be practically solved. The study of ocular tumors in this connection is of considerable interest on account of the close but sharply defined relations of tissues of different embryonic origin.

# IS THERE AN IMMUNITY FROM TRACHOMA?*

By Th. Axenfeld,

FREIBURG.

The epidemiological experience that, with people even who live in close contact and do not observe any special precautions, trachoma attacks some and leaves others untouched; furthermore, the different results from inoculation of the human conjunctiva,[1] as well as the varying distribution among different countries and peoples, have again and again led to the discussion of the question whether we are justified in speaking of an immunity for trachoma on the one and a disposition for trachoma on the other hand.

If we do not want to come to an unwarranted conclusion, we must continually remember the catching of a disease and the being spared may depend on very different causes, not only on disposition in the sense of a special receptiveness, or an immunity in the sense of resistance. Up to most recent times it has been forgotten altogether too often in the discussions on immunity and disposition of races, certain regions, the climate, of single individuals that the social and hygienic conditions favor or ward off the infection in a peculiar manner. We need only mention in a few words the much discussed immunity or disposition of races. It is surely of very little importance, and on this point I agree with Kuhnt, McCallan, Greef, Meyerhof and others, that there is probably no race which is really free from trachoma.

At the most we can assume a relative immunity in one and a relative receptiveness in the other. But even for this assumption decisive foundations are wanting since there are always other causes at work too.

The best known and best founded example, the immunity of the Negroes in the United States of North America, as first reported by Swan Burnett and afterwards by numerous other authors[2] in opposition to the strong infection of the Indians,[3] can be explained otherwise than by race immunity. For the Negroes live there mostly socially separated from the other people who are strongly afflicted with trachoma; in other parts where this is not the case, the Negroes, too, have trachoma not

*Klin. Mtsbl. f. Augenhlk., LIV., p. 121.

1. Axenfeld.—Aetiologie des Trachoms. (G. Fischer, Jena, 1914.)
2. Webster Fox.—Ophthalmic Record, December, 1912.
3. It is characteristic that for a time even certain Indian tribes were considered immune for trachoma.

infrequently, in some regions quite frequently, even (van Milligan) among the same tribes. Certainly, if such an unreceptiveness exists, it is limited. The more the African peoples are examined ophthalmologically the more cases of trachoma among Negroes are being reported; thus Krusius found it plentifully among the negroes of German East Africa.

Further, observations like those of Foley-Sergent and Meslin, who found a great many trachoma sufferers among negroes in the most southerly oasis of Algeria, although generally of a mild character, like that which was found among the Berbers and Arabs of the western oasis of Oran, at most speak for a relative immunity of the Negroes, but may be due to other causes.

That there is no climate immune for trachoma, is probably certain. Still, the climate, like the season, may influence the beginning of the infection and its course by the temperature, the manner of living, the mixed infections and their transmission. It is, for instance, possible that in some climates the infective material even outside of the conjunctiva remains for a longer time transmissible and virulent, and that other things, like the flies or other irritations, help to transmit it, while at other places these conditions are more or less wanting. These influences are especially noticeable in the descriptions of Palestine given by German, as in numerous works from very different countries.[4] In the same manner the long-refuted assumed immunity in high climates can usually be explained by different hygienic conditions, the close neighborhood in the low countries as compared with high ones, etc.

I mention these often discussed and long ago settled questions only because even in most recent times these climatic influences have been overestimated. They are not without importance, but probably never furnish an immunity in the real sense of the word.

In how far a personal receptiveness, in how far a more or less marked personal unreceptiveness may exist, we can judge only by taking into consideration all the possibilities. All the facts speak against the assumption brought forward again recently by Crisp, that the constitution is the real factor in the origin of trachoma. On the other hand, it is undoubtedly going too far when, for instance, McCallan denies all acquired and natural immunity. *A priori* we can assume that there are less receptive individuals; for otherwise trachoma would drop out of the series

4. Boldt.—Das Trachom., 1903. (Hirschwald, Berlin.) New confirming experiences from Palestine by Auerbach.

of the other infectious diseases, in all of which we have to count more or less with such a possibility. The experiments of Baeck and German, who repeatedly but without success transmitted trachoma to their own conjunctiva, cannot be simply refuted, as Greef[5] does, by declaring that the transmitted secretion had in these cases lost its virulence. On the other hand, I agree with him fully in that an even prolonged freedom from trachoma in infected surroundings or such a negative inoculation does not necessarily have to be looked upon as immunity.

In order to judge this question, it seems proper to consider the entity of an immunity of the conjunctiva in its relation to infection.

We must be clear about it that with immunity not the absolute size, but the proportion counts in which the virulence, quantity and the pathogenic aggressive effect of the infectious agent is related to the receptiveness or defensive power of the field of action. There is probably no absolute immunity for trachoma, since we must think of a special degree of virulence and a special mode of transmission which may surpass a previous unreceptiveness; and in the same manner there are probably all degrees of receptiveness, in the highest of which even little virulent material and small quantities can act, as they could not do under other conditions.

Remembering this, we must be loth to assume that an immunity is altogether refuted when a long spared individual or a long spared eye finally is infected; and in the same manner we must not overestimate the effect of eventual experimental inoculations. The latter the less since in trachoma every possibility is wanting to measure the virulence and quantity of the inoculated material, much less to bring only a measured quantity into the mucous membrane. To this we must add in animal experiments that the trachoma virus in the only receptive animal, the ape, acts only in a part of the cases, so that the lack of an effect cannot always be explained in the same manner.

When a secretion is simply brought into the conjunctival sac without injury or other mechanical influences, what makes the infection adhere under ordinary circumstances? We know from numerous experiments (van Genderen Stort, Bach) that non-pathogenic germs are in a short time completely eliminated from the conjunctiva. What causes pathogenic germs to adhere in spite of these eliminative forces and especially the mechanical action of the tear flow?

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5. Greef.—Beitræge zur Trachomforschung (Klin. Jahrb., 1909.)

Undoubtedly part of the pathogenic material is simply washed off before it can adhere in sufficient quantity. This is probably the simple explanation why a simple transmission does not always produce an infection and why a one-sided infection may spare the fellow eye for a long time. This elimination will result the more the less the transmitted virus is in quantity and virulence; the stronger the specific affinity between the pathogenic germ and the conjunctiva, the more independent becomes the infection of the mechanical defensive forces, the quicker it may adhere. But something must happen which retains them in the conjunctival sac so that they cannot be washed out. This is probably due to the penetration of the germs into the epithelium, in all those cases in which without scarification, without rubbing, a simple transmission of material produces the disease.

If in trachoma we have an immobile incitor, as is the case with bacterial conjunctivitis incitors, we may not assume that after the material has been introduced into the conjunctival sac the incitors penetrate actively into the epithelial cells. The word penetration is often misused in this sense. For this immobile germs lack the necessary condition. It must probably be brought about by a phagocytic process on the part of the epithelial cells.

If we do not want to assume that wandering cells play the intermediaries by taking up the germs and carrying them into the epithelium—and that is little probable—the epithelia themselves must get into apposition to them and ingest them. The receptiveness of the conjunctiva to certain incitors must then consist in a certain incitement to phagocytosis produced by them on the epithelia. The stronger this is—and this is probably what we call virulence—the easier and quicker the reception will take place, but we must not assume that the germs are destroyed; on the contrary they multiply to the cost of the cells and act as incitors of inflammation. Thus there exists in many conjunctivæ an epitheliosis which causes all the further changes. During the course of an infectious conjunctival catarrh too, we must not assume that the germs lying on the conjunctival surface and contained in the free secretion alone or chiefly produce an effect which incites inflammation. They probably do that less than the intraepithelial germs.

That a penetration into the epithelium must, indeed, be the main factor in the development of an infectious disease, is proven by the well known fact[6] that after experimental inocula-

6. Axenfeld.—Bakteriologie in der Augenheilkunde.

tions of the human conjunctiva with Koch-Weeks bacilli or diplobacilli these incitors at first disappear from the conjunctival secretion; during the period of incubation they cannot be found, not even culturally, only when the inflammation begins they reappear.

To this, furthermore, points the fact that germs can be found in the epithelia. This we know of the gonococci; the well known anatomical examination of Schridde[7] shows this plainly. Heymann and Lindner were right when in the discussion they pointed to the relations between gonorrhœa and trachoma and emphasized that gonococci, like the Prowaczeck inclusions, usually sit nest-like in the epithelial cells and the epithelial smear may furnish gonococci when in the secretion they are sought in vain.

Inequalities in the surface in the grooves of which material may remain for some time, the presence of mucus which may enclose and keep germs for some time, other previously present inflammatory elements may favor the process of adhesion, as also every rubbing or pressing manipulation to which an individual suffering from conjunctivitis is prompted and which may, of course, act with a different force on the two eyes. Herein lies the predisposing element of other pre-existing irritating conditions. We may, of course, think, too, that such disposing conditions and perhaps, also, mixed infections may change things and alter the affinity and activity of the tissue to the incitors. Similar influences (in the increasing and the retarding sense) are possible, though hard to prove, in consequence of general changes of the body and its constitution.

*Does a one-sided trachoma mean a one-sided immunity?*

The comparatively rare cases in which an untreated trachoma remains for years or continaully one-sided, have been looked upon as cases of one-sided immunity.[8] None of the adherents of this one-sided immunity have given an explanation how they think it develops. Do they mean that there is a bilateral relative natural resistance which in the diseased eye was, perhaps, unable to withstand a special quantity or kind of transmission or special disposing circumstances, while in the other eye it was able to ward off ordinary secretion and even the transmission from the diseased eye?

Has in the diseased eye the virus, perhaps, become weakened by adaptation so that the danger became less to the fellow eye? This will appear improbable to those who combine with adapta-

7. Zeitschr. f. Augenhlk., 1905, XIV., p. 525.
8. Hoffmann.—Dissertation from Kuhnt's Klinik and Wicherkiewicz, Congress of Polish oculists. Klin. Mtsbl. f. Augenhlk., 1911, p. 519.

tion, as a rule, the thought of an increased pathogenic action. Yet, this question is not irrelevant; for with other conjunctivitis incitors, for instance, the pneumococci and Koch-Weeks bacilli, it can frequently be observed that the affection of the second eye is a milder one. It is, of course, not possible to simply apply to trachoma with its quite different ætiology the experiences made with such bacteria. Or might the affection of one eye act immunizing on the other? The experiments of Lindner with the virus of the inclosure blennorrhœa of apes certainly do not speak for this. He found that one-sided infection and affection with this virus saved this eye only from reinfection, while the other remained receptive.

Greef and Meyerhof oppose strenuously the idea that in cases of one-sided trachoma there is a one-sided immunity.

As Meyerhof has observed, an infection of the second eye may occur after many years. One case was peculiarly convincing in which after three years of a very severe trachoma in one eye the second one became spontaneously affected, under the appearance of an acute trachoma with pannus and Prowaczek inclusions.

Even more distinct is the trachoma which Mijashita obtained in the hitherto sound eye from the one-sided affected eye.

This inoculation of Mijashita does, however, not prove for the hitherto free second eye that it was possessed of an undiminished receptiveness even for the manner of transmission, as it naturally takes place, by secretion simply entering the conjunctival sac. Rubbing it in with a cotton pledget, as Mijashita did, was a much more energetic inoculation, a regular pressing the virus in. Therefore a relative immunity might have existed and has not been totally denied by Mijashita.

Meyerhof's observations in which the virus appears to have been unusually virulent, also does not refute the possibility that a weaker virus might perhaps not been able to produce the disease.

Neither must we neglect in order to come to a complete judgment in this question the already mentioned negative experiments of German. Repeated transmissions of secretion from the diseased to the other healthy eye have never produced the disease. Of course, as Mijashita says in his criticism, we may put against these negative transmissions, that thereby an immunity is not absolutely proven, because the inoculated material did no longer contain incitors and was no longer infectious. This, however, is only an assumption.

Certainly, the cases of lasting one-sided trachoma are strange and the assumption of a relative unreceptiveness is still an open question, especially when we think of the cases in which in spite of secretion and without any care being exerted even in very unclean individuals this one-sidedness continues.

Finally it is possible that for the own virus the receptiveness might be less than for foreign virus. In cases in which the long unaffected eye finally becomes affected, we must not forget that this new infection might be due to a foreign virus. This could be excluded only, if the patient under clinical observation had been kept from every contact with other patients beyond the possible time of incubation. In how far this was the case in Meyerhof's patient cannot be gathered from his publication. It cannot with certainty be stated whether this infection took place when the trachomatous eye was operated on five days before the inflammation appeared, or whether this was not due to a previous other infection.

Certain it is, from Mijashita's and Meyerhof's interesting observations, that we are not permitted in one-sided trachoma to declare the eye which remains healthy to be completely immune to trachoma; neither can we look upon an individual who has long been spared as with certainty unreceptive to a virulent material; yet, a relative immunity, in the sense of the possibilities mentioned, is thereby not excluded.

However, the one-sided trachoma cases are not alone among the conjunctival infections. In all of these we see not only great differences in the intensity in both eyes, but, also, purely one-sided cases. What defends the one eye in the individual case we cannot tell any more than in trachoma. But in these other infections we can no more assume that the freedom of the one eye represents an unreceptiveness in the sense of a complete immunity. Immunity is anyhow not an absolute value, but a relative peculiarity varying considerably in degree.

It is no less difficult to gain clinically an opinion *whether and in how far trachoma itself produces a local immunity or not.*

Doubtless new infections take place in eyes which had been considered cured, after a shorter or longer interval. Are these relapses or reinfections?

Numerous authors consider reinfection as possible and frequent. Kuhnt in particular refers a large part of the trachomas which appear in cured cases to it and emphasizes that in the critical study of a therapy this possibility must be taken into

account. Not every case in which after combined excision later on severe symptoms appear, is a relapse, but there is probably a reinfection. Lindner, too, assumes that in trachoma afflicted countries frequent reinfections are the cause of the severe affections.

This includes the opinion that after a cured affection an immunity does not necessarily exist and Meyerhof[9] to whom we owe very valuable observations forcibly states that an acquired immunity cannot exist. Others, like Warschawsky,[10] on the contrary, uphold such an immunity because in their country grown up individuals who in childhood had suffered from trachoma are relatively very rarely again attacked.

At this date the question must remain open. In studying it it will be well to take into account experiments made on man and apes to produce an artificial immunity.

*Experiments on artificial immunization.*

Hess and Roemer have previously drawn attention to the fact that the weakening of the clinical picture in inoculated eyes may, perhaps, furnish the ground for immunization experiments, and Prowaczek-Halberstaedter have stated as their opinion that the trachoma virus, like that of various vaccines, is capable of mutations and that this, perhaps, might lead to an efficient therapy.

This idea has often been repeated, but the manner in which to go about in this direction has never been shown.

But there are a series of interesting communications concerning the question in how far in the ape the cure of trachoma produces a security from reinfection and in how far it is possible to make him unreceptive to the infection by intravenous or local injection of the virus, that is through active immunization of the conjunctiva.

According to Nicolle-Cuénod-Blaizot the macacus inuus is immune after the complete cure of one trachoma attack. They draw this conclusion with such certainty because this animal according to their statement is without exception receptive for a virulent trachoma virus. A reinfection in from one to six months after the cure of the first typical infection did not succeed. However, a reinfection in the stage of recession, but before a finished cure, resulted in a severe relapse.

Repeated (five to ten malignant ones in two to three weeks)

9. On repeated reinfection with trachoma. Centrlbl. f. Augenhlk., 1911, p. 295.

10. Statistics of trachoma in the Kaukasus. Westnik. Oft., 1913, XXX., p. 569.

intravenous injections of virulent trachoma material suspended in normal salt solution and freed from larger particles by centrifugation rendered three macaci immune against conjunctival inoculation, while two control animals were typically affected. Another ape (Schimpanse) could not be immunized by one intravenous injection.

No conclusions are drawn by Nicolle-Cuénod-Blaizot as to man, because in man the course of this disease is much more severe and lasts longer than in the macacus.

Yet they have tried to treat trachoma in a similar manner in man.

This idea is not new. It is like a vaccine treatment by which the aim is the formation of antibodies in the body which are to aid the defense against the local affection. Just for such exclusively locally pathogenous, the conjunctiva alone affecting trachoma infections, such thoughts are especially fit according to Wright's opsonin theory. It is known that the diplobacillus infection has been studied in this manner (to be sure with pure cultures) (Bryan, V. Reis, Tschirkowsky) with, however, limited success. For trachoma the incitor of which we cannot culture a parenteral injection of trachoma material has, also, been thought of. I myself have at the British Medical Association meeting in 1907 at Sheffield spoken of this and stated that the outlook was not exactly promising, because, on the one hand, no large quantity of material was at hand on account of the impossibility of culturing the incitor and then because these exclusively eye pathogenous infections do not give the impression that they are capable of producing more forcible reactions on the part of the antibody producing organs.

Roemer's experiments, also, point in this direction. Roemer tried to produce an anti-trachoma serum by treating rabbits with extracts from fresh and dry trachomatous transition folds in order to establish with this serum, with conjunctival secretion and tissue extracts a specific, diagnostically valuable complement diversion. But this experiment was negative; there only resulted an antiserum which reacted to human albumen, but did not permit of distinguishing between trachomatous and other conjunctival secretions.

The serum of trachomatous individuals, also, gave no specific complement diversion. Roemer rightly concludes that in the serum of the trachomatous no specific antibodies seem to be formed.

A. Leber, too, has never been able to produce complement diversion with the serum of the trachomatous. In one case Porgess' lecithin precipitation resulted; yet this observation remained single.

Nicolle-Cuénod-Blaizot, however, have proven that the repeated intravenous injection of triturated trachoma material freed in normal salt solution of larger particles by centrifugation is innocuous for man, causes no reaction and produces no conjunctival affection.

They then injected trachomatous individuals partly with material taken from their own conjunctiva by scraping with a spoon (autovirus), partly from other patients (heterovirus). After about one week under otherwise indifferent treatment a marked improvement resulted which in one case led to a cure in three months with four injections. However, not all of the individuals improved, only a part of the ten patients could be observed for a prolonged time. The authors draw no definite conclusions, but look upon these cases as material for the study of this question.

Subconjunctival injections, too, with autogenous material under the trachomatous conjunctiva have been tried by Nicolle-Cuénod-Blaizot first in a series of 154 patients and later in every trachomatous patient. They praise the success, but do not deny that a curative factor may lie in the scraping for getting the material. Part of their patients were moreover treated with other remedies.

These authorities do not say how they explain the curative action of these injections. *A priori* the direct injection of living virus into the subconjunctival tissue does not seem free from misgivings, unless we want to assume that it is deposited outside of the parts which are affected with trachoma (epithelium, adenoid tissue) and that thereby a curative reaction is produced in the neighborhood of the disease focus.

According to a report in the *Klinisch-therapeutischen Wochenschrift*, 1913, Trabut, Négre and Raymond have in the Société de Biologie referred to similar therapeutic experiments in trachoma made by them with subconjunctival injections of trachoma virus. They injected several times 1/6 to 1/2 ccm. of fluid consisting of tears, blood and epithelium which collected in the conjunctival sac after severe rubbing of the same conjunctiva. Trachomatous ulcers healed relatively rapidly after this. The results varied, in some cases a decided improvement was produced.

We must here, also, remember that the rubbing itself has a curative value, perhaps also the injection as such; under no circumstances do these experiments allow any conclusions in the sense of a specific immunization.

In judging the curative effect of such conjunctival injections we must furthermore remember that the injection as such seems by its reaction capable of a curative effect. Control experiments in this direction do not exist. But I call attention to the fact that Pes[11] reports improvements in trachoma from the injection of normal serum (horse, donkey) and diphtheria serum into the transition folds, an effect which Pes rightly does not consider a specific action of the diphtheria autotoxin, but due to the constituents of the normal serum and the tissue reaction and increase of the defensive forces produced by them. The injection of the own serum and tissue juice cannot be considered as the same, but even the mechanical action combined with it might have certain effects. We must certainly be very careful in accepting such conclusions as to a definite ætiology and a specific immunizing process from such therapeutic experiments.

Finally, when directly injecting tissue material from one individual into another we must not forget that we may transmit other diseases, for instance, lues, unless we take the greatest care in our selection.

All in all, the outlook for such a specific immunity therapy is little favorable. How these immunizing experiments will develop when we once possess the incitor in any quantity at our disposal, the future will have to demonstrate.

11. Sulla sieroterapia nella conjunctivite granulosa. Ophthalmologica. 1910, p. 317.

# SYMPATHETIC OPHTHALMIA.*

By Dr. A. Jess.

Following the comprehensive article in Graefe-Saemisch by Schirmer, the author discusses in a general review the debated and still unsolved questions of sympathetic ophthalmia up to newest studies of the serologists. He, like really all authors do without exception, sets aside sympathetic irritation as a separate disease which has an exceedingly varied appearance on account of the participation of the sensitive nerves, the sensory apparatus, the accommodative action of the ciliary muscle, the secretory apparatus with its vasomotor and trophic disturbances.

The observations of many years have proven that sympathetic irritation can never be looked upon as a preceding stage of inflammation nor as a slight degree of it. The only therapy is the enucleation of the sympathizing eye (first eye) if it is already phthisical or the removal of the irritating affection, as a staphyloma or a dislocated or swelling lens.

Nothing definite is, thus far, known concerning the transmission of the irritation from one eye to the other. Yet, it is assumed that irritation is conducted through the ciliary ganglion, the ramus ophthalmicus, the ganglion Gaseri and the trunk of the trigeminus to the nucleus of this nerve and from there over to the other side centrifugally by the same route to the fellow eye.

The picture of true sympathetic ophthalmia is much less characteristic, as a similar affection is observed, too, in non-traumatic iridocyclitis, even when due to a systemic disease and can be correctly diagnosed only by means of the anamnesis and the condition of the eye first affected. Since when the disease is once developed in the second eye the enucleation of the first eye does in no way affect it (as is the case with sympathetic irritation) even this fact cannot be used to affirm the diagnosis. Severity and extent of the perforating injury to the first eye have no special influence on the origin and the beginning of the sympathetic inflammation; a more or less smooth healing is of more importance. But even after a healing without reaction, even after operative wounds, suddenly a sympathetic inflammation may set in, as many a physician has to his chagrin had occasion to observe. The time interval between the first and the second

*Abstract by Peltesohn in Centrabl. fuer prakt. Augenhlk., March, 1915.

eye is characteristic, which almost never was less than two weeks, but may reach from 20 to 42 days, with the most dangerous period between the fourth and sixth week. It is not necessary to refer here to the well known pictures of iridocyclitis serosa and fibrinosa with their varying favorable prognosis from which papilloretinitis separates itself as an isolated disease picture, and the various results of which, as keratitis, scleritis, cataract, glaucoma, optic nerve atrophy, etc., are well known, while in rare cases, as shown by Axenfeld, a detachment of the retina may precede the sympathetic iridocyclitis. The knowledge of the pathological anatomy of sympathetic ophthalmia has been especially enriched by Fuchs and he has deliminated the anatomical picture of the uveal affection so sharply that we can recognize with certainty the true cases of sympathetic inflammation. There are several characteristic cell forms; beside small, mononuclear lymphocytes we find epithelioid and giant cells, so that in some cases the picture resembles tuberculosis. There is, however, never any sloughing of tissues and there are never any tubercule bacilli. The iris is less affected than the ciliary body and the choroid, the latter being often several times its normal thickness. Especially, the layers containing the larger bloodvessels are infiltrated and the bloodvessels show such a peculiar aggressiveness of the infiltration that Fuchs thought himself compelled to assume that the sympathetic inflammation was transmitted by the blood current. There are in the main still three theories of transmission, as already mentioned by Mackenzie in the very first publication in 1835 in his text-book: by the optic nerve, by the ciliary nerves, and by the bloodvessels. The first one has its strongest champions in Leber and Deutschmann, who have been working since 1880 until the most recent times to collect material for their theory without, however, finding the support of the authors. The second possibility by way of the ciliary nerves has found some supporters only through Schmidt-Rimpler's modification, according to which an irritation is produced from one eye to the other which causes a locus minoris resistentiæ which makes possible the localization of micro-organisms pathogenic for the eye which accidentally circulate in the blood. This, however, would have to occur as well in glaucoma, panophthalmitis and in other severe states of irritation, but does in fact not happen. It would, moreover, explain the characteristic time interval between the affections of the two eyes as little as that a sympathetic inflammation may come into

appearance long after enucleation when a ciliary irritation is no longer in existence. Experiments to prove Schmidt-Rimpler's theory have been little convincing. The smallest irritation of the eye with Esbach's reagent certainly produces an increased amount of albumen in the aqueous fluid of the same eye (Wessely), but never in the aqueous fluid of the fellow eye, even when the first one was irritated by means of a continuous most severe lesion of the ciliary body. Roemer, too, who employed hæmolysins, which at the least irritation at once enter the aqueous humor, never could demonstrate even the smallest quantity of hæmolysins in the aqueous humor of the other eye, even when he added the irritation and cutting of the trigeminus of the one side. However, Stock opposed these conclusions by insisting that the result of experiments on animals cannot simply be applied to the human eye.

Roemer in the main supports the third theory, the transmission by way of the blood current, which formerly had been rather unsuccessfully upheld by Berlin. He thinks it probable that the incitor of the sympathetic inflammation is a micro-organism specific for the eye, which for a long time remains dormant in the first eye or somewhere in the body without causing any symptoms until after the injury to the eye by metastasis the sympathetic inflammation results. Opposed to this is the fact that at least after a certain time without doubt enucleation prohibits sympathetic inflammation, even if the incitor may remain dormant in the body, and it does not explain those rare but undoubted cases of sympathetic inflammation from intraocular sarcoma which has not penetrated the sclerotic, in which we would have to assume an inflammation free from bacteria.

With the progress of serology a number of authors, as Brown Pusey, Golowin and Santucci, Sattler studied the question from a serological standpoint. Bail and Elschnig tried experimentally to produce a very similar uveal inflammation on an anaphylactic basis. They argued that by the antigen absorption of diseased uveal tissue a hypersensitiveness is produced in the organism and especially in the homologous organ, the fellow eye. As in von Pirquet's test, on account of this increased faculty of reaction inflammations are produced by introducing the anaphylactising agent from without, thus in our case an inflammation would result from the slightest disturbance in the sensitized eye, by the destruction even of one uveal cell, with the serious consequence conditioned by the vulnerability of the organ. Regarding sym-

pathetic inflammation Elschnig assumes that through the destruction and the antigen absorption of the pigment an anaphylaxation of both eyes occurs. There must be in addition a somatic anomaly, as perhaps a constitutional anomaly or autointoxication, in order to explain how the sympathetic inflammation starts in the fellow eye and why not in every case and why so often after a long time only. We must admit that Elschnig's theory explains some clinical facts better than the bacterial theories, for instance the time interval of at least two weeks, which would be explained by the time necessary of ten to twelve days for the anaphylaxis due to antibody formation. Even the sympathetic inflammation with intraocular sarcoma would be thus explained. There is a certain interest, further on, in the experiments of Guillery with injection of sterile ferment solutions and bacteria filtrates which were meant to produce the proof that even without specific incitors, purely by a poisonous action, very similar inflammatory processes may be inagurated. On the other hand, Szily, Fuchs, Jr., and Meller have shown the difference between sympathetic and anaphylactic inflammation by means of careful pathological anatomical examinations, and also clinical differences have been found so that the assumed identity of these two forms of iridocyclitis cannot be upheld at present. Finally Abderhalden's test has been used for the recognition of the nature of sympathethic ophthalmia, but hitherto without success.

Thus by the papers of the last decade many a new viewpoint has been gained for the doctrine of sympathetic ophthalmia from which the last road to the solution of the problem may, perhaps, be gained.

As regards practice and therapy, however, as the author correctly states, we have not come a step farther. Inunctions and enucleation are still the chief methods, as in older times. That salvarsan means a progress has been as much affirmed as denied.

# MEDICAL SOCIETIES.

## AMERICAN OPHTHALMOLOGICAL SOCIETY.

The Fifty-First Annual Meeting of the Society will be held at The Hotel Griswold, Eastern Point, New London, Conn., on Tuesday and Wednesday, July 6 and 7, 1915.

The following titles of papers to be presented at the meeting have been received, and the order of presentation arranged as follows by the Program Committee:

Tuesday Morning, July 6, 9:30 o'clock.

1. Review of the Glaucoma Question, with Special Reference to the Newer Conclusions of its Etiology and Departures of its Surgical Treatment. By Robert Sattler, M.D., Cincinnati, Ohio.
2. A Report of Several Cases of Chronic Simple Glaucoma Treated by Iridotasis. By David Harrower, M.D., Worcester, Mass.
3. A Further Contribution to the Operation of Iridotasis in Acute and Chronic Glaucoma. By Dunbar Roy, M.D., Atlanta, Ga.
4. Tenotomy of Inferior Oblique Muscle. By William Campbell Posey, M.D., Philadelphia.
5. Rosacea Keratitis and Certain other forms of Marginal Keratitis, Neuropathic in Origin. Treatment by Pericorneal Neurotomy. By F. H. Verhoeff, M.D., Boston.
6. Some Experiences in Enucleation Under Local Anæsthesia. By William M. Sweet, M.D., Philadelphia.
7. Salvarsan in Interstitial Keratitis and in Optic Nerve Lesions. By Arnold Knapp, M.D., New York.
8. Brawny Scleritis. By George S. Derby, M.D., Boston, Pathological Examination by F. H. Verhoeff, M.D., Boston.

Tuesday Afternoon, July 6, 2 o'clock.

EXHIBITION OF NEW INSTRUMENTS AND APPARATUS.

9. The Ives-Langdon Photometer. By H. Maxwell Langdon, M.D., Philadelphia.
10. A Review of the History of the Electric Ophthalmoscope, with a Demonstration of a New Ophthalmoscope, which Consists of a Rearrangement of the Parts of Antecedent Instruments. By J. Herbert Claiborne, M.D., New York.

11. A More Exact Method of Measuring Fields of Vision and Arcs of Rotation. By Lucien Howe, M.D., Buffalo, N. Y.
12. Stronger Eye Magnets. By Walter B. Lancaster, M.D., Boston.
13. Ocular Phenomena Accompanying Three Cases of Gastro-Intestinal Disorder. By Hiram Woods, M.D., Baltimore, Md.
14. Examination of the Spinal Fluid in Affections of the Eye. By James B. Ayer, M.D., Boston. (By invitation.)
15. The Miliary Choroidal Tubercle as Associated with Tuberculous Cerebrospinal Meningitis. By Frederick Tooke, M.D., Montreal, Canada.
16. Malignant Uveitis. By James Bordley, Jr., M.D., Baltimore, Md.
17. Progressive Atrophy of all Layers of the Iris. By G. E. de Schweinitz, M.D., Philadelphia.

8 p.m. Executive Session.

Wednesday Morning, July 7, 9 o'clock.

18. Forms of Ophthalmia Met with in the Orient. By Harry Friedenwald, M.D., Baltimore, Md.
19. Pemphigus of the Conjunctiva. Report of Two Cases. By Edward Stieren, M.D. Pittsburgh, Pa.
20. Colloid Degeneration of the Upper Eyelid. By Arthur J. Bedell, M.D., Albany, N. Y.
21. Note of a Case of Epibulbar Sarcoma. By Howard F. Hansell, M.D., Philadelphia.
22. Multiple Melanotic Nevi of Conjunctiva, with Malignant Invasion of Corneal Limbus. By F. P. Capron, M.D., Providence, R. I.
23. Report of Two Cases of Metastatic Carcinoma of the Choroid and a Case of Myxosarcoma of the Orbit. By John E. Weeks, M.D., New York.
24. A Case of Primary Intradural Tumor of the Optic Nerve. By Arnold Knapp, M.D., New York.
25. A Case of Primary Intradural Tumor of the Optic Nerve. By Charles R. Heed, M.D., Philadelphia.
26. A Contribution to the Subject of Tumors of the Eye, Eyelid, and Orbit. By G. E. de Schweinitz, M.D., Philadelphia.

Wednesday Afternoon, July 7, 2 o'clock.

27. Hereditary Posterior Polar Cataract, with Report of a Pedigree. By S. Lewis Ziegler, M.D., and J. Milton Griscom, M.D., Philadelphia.
28. Family Degeneration of the Macula Lutea. By Brown Pusey, M.D., Chicago, Ill.
29. A Case of Retinitis with Massive Exudation. By William Zentmayer, M.D., Philadelphia.
30. Spontaneous Reattachment of the Retina, with Report of a Case. By A. Edward Davis, M.D., New York.
31. Accommodative Insufficiency. By Alexander Duane, M.D., New York.
32. Nervous Symptoms from Contusions of the Eye. By Edward R. Williams, M.D., Boston.

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## COLORADO OPHTHALMOLOGICAL CONGRESS.

Partial list of papers to be read at the Congress in Denver, July 22nd-23rd.

Protection of the Eyes from Harmful Radiations in the Various Professions, Trades, and Industries. By Dr. Nelson M. Black, Milwaukee, Wis.

Herpes Zoster Illustrated by Clinical History of Five Cases. By Dr. Burton Chance, Philadelphia, Pa.

Business and Office Methods in Special Practice. By Dr. Linn Emerson, New York, N. Y.

Albinism in Man and Animals with Special Reference to the Eye. By Dr. W. E. Gamble, Chicago, Ill.

The Routine Treatment of Senile Cataract by Expression, with a Sliding Conjunctival Flap. By Dr. H. Gifford, Omaha, Neb.

The Blind Spot. By Dr. H. S. Gradle, Chicago, Ill.

Juvenile Recurring Hæmorrhage, Massive Exudation and Tuberculosis of Retina. By Dr. Edward Jackson, Denver, Colo.

Arrest of Cataract at an Early Stage. By Dr. E. L. Jones, Cumberland, Md.

Is Migraine a Forerunner of Glaucoma? By Dr. R. S. Lamb, Washington, D. C.

Peripheral Annular Infiltrate of Cornea Following a Scleral Perforation. By Dr. Francis Lane, Chicago, Ill.

Conscious Vision in Development of Amblyopic Eye. By Dr. F. P. Lewis, Buffalo, N. Y.

Ocular Tuberculosis Caused by Tuberculosis of Neighboring Sinuses. By Dr. W. H. Luedde, St. Louis, Mo.

Use of Lead Styles in Treatment of Stenosis of Lacrimal Duct. By Dr. H. Moulton, Fort Smith, Arkansas.

Carcinoma Apparently Primary in the Uveal Tract. By Dr. E. R. Neeper, Colorado Springs, Colo.

Concerning the Surgical Treatment of Retinal Detachment. By Dr. E. S. Thomson, New York, N. Y.

Management of Eyelids During Cataract Operation. By Dr. D. T. Vail, Cincinnati, Ohio.

Mydriatic Action of Dextro-Hyoscyamine. By Dr. Meyer Wiener, St. Louis, Mo.

Complete Left Lateral Hemianopsia with Glycosuria as Result of Slight Trauma. By Dr. F. E. Woodruff, St. Louis, Mo.

Trephining Versus Iridectomy in Glaucoma. Dr. H. W. Woodruff, Joliet, Illinois.

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## ABSTRACTS FROM MEDICAL LITERATURE.

By W. F. Hardy, M.D.,
St. Louis, Mo.

### THE INTRA-OCULAR TENSION, WITH ESPECIAL REFERENCE TO ITS VARIATIONS IN GENERAL AND LOCAL VASCULAR DISEASE.

R. Foster Moore (*Royal London Ophthalmic Hospital Reports*) contributes a paper under the above heading. His observations were based on 184 patients, a majority of whom were suffering from some local disease of the retinal vessels associated with general arteriosclerosis. Schiötz tonometer was used; cocaine was the local anæsthetic. Moore took the tension with the patient in a semi-recumbent position. He seldom holds the lids apart except in applying the instrument. Proceedings are facilitated by having the foot piece of the instrument

warmed. The article takes up twenty pages and is well worth reading in the original. Moore comes to the following conclusions as a result of his study:

(1) Schiötz tonometer is a thoroughly satisfactory instrument, and in its use holocain has no advantage over cocaine.

(2) Reasonable normal limits for the intra-ocular tension are from 15.5 mm. to 25 mm.

(3) No parallelism exists between the variations in intra-ocular tension and the general blood pressure.

(4) Patients whose general blood pressure is greater than 220 mm. have an intra-ocular tension which is only 1 mm. higher than those whose blood pressure is less than 160 mm.

(5) The general blood pressure of patients who have a high intra-ocular tension from glaucoma is little, if at all, raised above the normal.

(6) The intra-ocular tension can roughly be halved by reduction of the local blood pressure in the vessels of the eye, and this is also true of glaucomatous tension.

(7) The pulse wave is almost invariably transmitted to the tonometer lever, the amplitude of its movements varying inversely as the height of the general blood pressure.

(8) In a few cases of high general blood pressure no pulse movement is seen.

(9) In some cases of retinal arterio-sclerosis with a high general blood pressure, this high pressure is so damped down by thickening and rigidity of the vessel walls, or by sub-endothelial proliferation, that the pressure in the retinal vessels is not raised, and may be instead below the normal. In this case thrombosis of the retinal arteries is likely to occur.

(10) General arteriosclerosis is not a causative factor in simple primary glaucoma, and an attempt to reduce the general blood pressure in such cases is not likely to improve the condition of an eye in which the local blood pressure may already be below the normal.

(11) Homatropine produces a slight increase of the intra-ocular tension in most cases of arteriosclerosis, but in no case of the present series was it thereby raised above the normal. The same is true of tributary venous thrombosis.

(12) In cases of thrombosis of the central retinal vein homatropine often produces a considerable rise in the intraocular tension, and this not only in the affected but also in the unaffected eye.